



## Electroactive Functionalization of Graphene as Nanohybrid Materials for Redox Sensing and Energy Storage

Chi, Qijin; Zhu, Nan; Gan, Shiyu; Ulstrup, Jens; Zhang, Pifu

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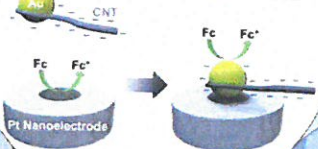
# Electrochemistry at the nanoscale from basic aspect to applications

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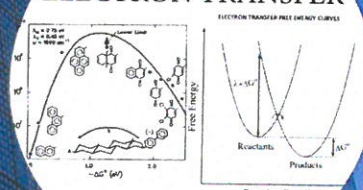
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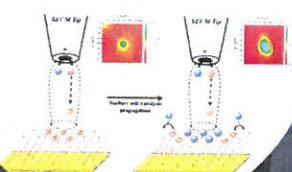
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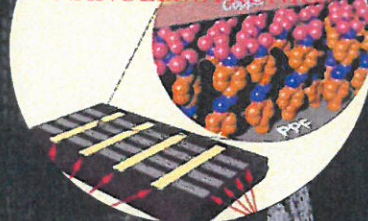
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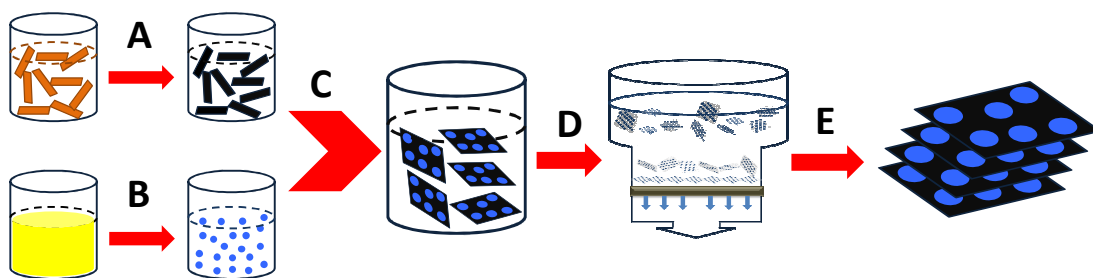


## Electroactive Functionalization of Graphene as Nanohybrid Materials for Redox Sensing and Energy Storage

Qijin Chi, Nan Zhu, Shiyu Gan, Jens Ulstrup, and Pifu Zhang

Department of Chemistry, Technical University of Denmark, 2800 Kongens Lyngby, Denmark. (E-mail: [cq@kemi.dtu.dk](mailto:cq@kemi.dtu.dk); Phone: +45 45252032)

As an atomic-scale-thick two-dimensional material, graphene has emerged as one of the most miracle materials and has generated intensive interest in physics, chemistry and even biology in the last decade.<sup>(1,2)</sup> Nanoscale engineering and functionalization of graphene is a crucial step for many applications ranging from catalysis, electronic devices, sensors to advanced energy conversion and storage.<sup>(3)</sup> In this talk, we *first* present a general theme for functionalization of graphene nanosheets, followed by showing our recent studies on electroactive functionalization of chemically exfoliated graphene materials and their potential applications in sensors, redox-based memory storage and supercapacitors. Our systems studied cover redox-active nanoparticles, electroactive supramolecular ensembles and redox enzymes which are integrated with graphene nanosheets and further transformed into thin films or graphene papers.<sup>(4-7)</sup> Figure 1 shows an example for preparation of *Prussian blue* nanoparticles (PBNPs) doped graphene oxide (GO) and reduced GO (RGO) papers.



**Figure 1. Schematic illustration of preparation of *electroactive, flexible and free-standing graphene papers*.** A) Wet-chemical conversion of GO to RGO via hydrazine reduction, B) synthesis of PBNPs starting from the mixture of  $\text{FeCl}_3$  and  $\text{K}_4\text{Fe}(\text{CN})_6$ , C) preparation of PBNPs-RGO hybrid nanosheets, and D) and E) processes of preparing PBNPs-RGO hybrid paper including filtration, drying and annealing.<sup>(4)</sup> Not drawn to scale.

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